# A framework for assessing the salience of landmarks for wayfinding tasks

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Abstract: Background: Landmarks play an important role for the understanding of and reasoning about physical large-scale space. Landmarks also play an important role in every day's spatial tasks, such as wayfinding and navigation. The property of being a landmark has so far been attributed to distinct objects, which are either well known or otherwise unique, such as the Eiffel Tower or a lighthouse on the shore. We propose a framework for the assessment of the landmarkedness of potential landmarks for wayfinding tasks, which is based on the relationship between observer, physical environment, and potential landmark. We argue that landmarkedness is not an inherent property of some object, but rather the result of this tri-lateral configuration. The basic idea is to use this configuration to define the individual components that contribute to the total salience of the object and integrate them in a coherent framework. Main contribution: The framework considers two types of salience: (1) the perceptual salience, which describes the potential of a feature to capture a wayfinder's attention (attentional capture), and (2) the cognitive salience, which explains how strong attention is guided by the wayfinder (attentional orienting). The assessment of the perceptual salience is based on the salience of the incoming stimuli, the perceived concepts, and the spatial layout of a scene, while the cognitive salience considers the subjective importance of the object with respect to the individual's context and knowledge. The most general requirement of a landmark is that it must be salient in some sense. This requires that it contrast with the environment, either in terms of its attributes (i.e., color, texture, etc.), the status of the perceived concept (i.e., church or commercial building), or due to its spatial location with respect to the other objects in the scene (i.e., in the middle of town). Such contrast, however, is only perceivable if the potential landmark is visible from the observer's current point of view. Therefore, for assessing an object's landmarkedness, we consider attributes, objects, and relations to other visible objects only. In addition to the salience perceived from physical contrast, the cognitive abilities of the observer play an important role in selecting appropriate objects for reference. This subjective selection implies that the context, together with our knowledge, thoughts and preconceptions shape what we perceive and finally select as reference for making decisions, which directly influences the assessment of the relative importance or salience of potential landmarks. The assessment of the salience of potential landmarks, hence, needs to consider cognitive aspects, along with the perceptual stimuli. Implications: The accurate assessment of the relative importance of geographic objects is a crucial aspect of many wayfinding-related tools and applications, such as route generation and description algorithms, navigation systems, or location-based services. The integration of appropriate landmarks in such applications decreases the cognitive load put on the wayfinder, and hence increases efficiency and reliability of the applications

DOI: https://doi.org/10.1007/s10339-006-0049-7

Originally published at:
Caduff, David; Timpf, Sabine (2006). A framework for assessing the salience of landmarks for wayfinding tasks. Cognitive Processing, 7(S1):23.
DOI: https://doi.org/10.1007/s10339-006-0049-7

Cogn Process (2006) 7 (Suppl. 1):S23
DOI 10.1007/s10339-006-0049-7

ORAL PAPER

# A framework for assessing the salience of landmarks for wayfinding tasks

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Published online: 28 July 2006


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*Background* Landmarks play an important role for the understanding of and reasoning about physical large-scale space. Landmarks also play an important role in every day's spatial tasks, such as wayfinding and navigation. The property of being a landmark has so far been attributed to distinct objects, which are either well known or otherwise unique, such as the Eiffel Tower or a lighthouse on the shore. We propose a framework for the assessment of the landmarkedness of potential landmarks for wayfinding tasks, which is based on the relationship between observer, physical environment, and potential landmark. We argue that landmarkedness is not an inherent property of some object, but rather the result of this tri-lateral configuration. The basic idea is to use this configuration to define the individual components that contribute to the total salience of the object and integrate them in a coherent framework.
*Main contribution* The framework considers two types of salience: (1) the perceptual salience, which describes the potential of a feature to capture a wayfinder's attention (attentional capture), and (2) the cognitive salience, which explains how strong attention is guided by the wayfinder (attentional orienting). The assessment of the perceptual salience is based on the salience of the incoming stimuli, the perceived concepts, and the spatial layout of a scene, while the cognitive salience considers the subjective importance of the object with respect to the individual's context and knowledge. The most general requirement of a landmark is that it must be salient in some sense. This requires that it contrast with the environment, either in terms of its attributes (i.e., color, texture, etc.), the status of the perceived concept (i.e., church or commercial building), or due to its spatial location with respect to the other objects in the scene (i.e., in the middle of town). Such contrast, however, is only perceivable if the potential landmark is visible from the observer's current point of view. Therefore, for assessing an object's landmarkedness, we consider attributes, objects, and relations to other visible objects only. In addition to the salience perceived from physical contrast, the cognitive abilities of the observer play an important role in selecting appropriate objects for reference. This subjective selection implies that the context, together with our knowledge, thoughts and preconceptions shape what we perceive and finally select as reference for making decisions, which directly influences the assessment of the relative importance or salience of potential landmarks. The assessment of the salience of potential landmarks, hence, needs to consider cognitive aspects, along with the perceptual stimuli.
*Implications* The accurate assessment of the relative importance of geographic objects is a crucial aspect of many wayfinding-related tools and applications, such as route generation and description algorithms, navigation systems, or location-based services. The integration of appropriate landmarks in such applications decreases the cognitive load put on the wayfinder, and hence increases efficiency and reliability of the applications.

**Keywords** Wayfinding · Landmarkedness · Salience

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